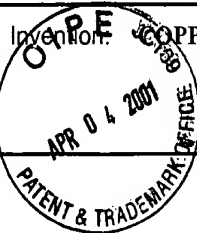
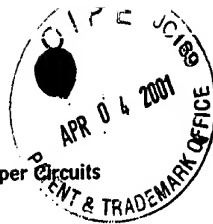


<b>AMENDMENT TRANSMITTAL LETTER (Large Entity)</b>			Docket No. EN997064		
Applicant(s): Kathleen L. Covert et al.					
Serial No. 09/274,935	Filing Date March 23, 1999	Examiner Alexander Markoff	Group Art Unit 1746		
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  </div> <div> <p>Inventor: <b>COPPER CLEANING COMPOSITIONS, PROCESSES AND PRODUCTS DERIVED THEREFROM</b></p> <p style="text-align: center;"><u>TO THE ASSISTANT COMMISSIONER FOR PATENTS:</u></p> <p>Transmitted herewith is an amendment in the above-identified application. The fee has been calculated and is transmitted as shown below.</p> </div> </div>					
<b>CLAIMS AS AMENDED</b>					
	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST # PREV. PAID FOR	NUMBER EXTRA CLAIMS PRESENT	RATE	ADDITIONAL FEE
TOTAL CLAIMS	20 -	20 =	0 x	\$18.00	\$0.00
INDEP. CLAIMS	4 -	4 =	0 x	\$80.00	\$0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT					\$0.00
<div style="display: flex; justify-content: space-between;"> <div> <p><input checked="" type="checkbox"/> No additional fee is required for amendment.</p> <p><input type="checkbox"/> Please charge Deposit Account No. _____ in the amount of _____ A duplicate copy of this sheet is enclosed.</p> <p><input type="checkbox"/> A check in the amount of _____ to cover the filing fee is enclosed.</p> <p><input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 09-0457 A duplicate copy of this sheet is enclosed.</p> <p><input checked="" type="checkbox"/> Any additional filing fees required under 37 C.F.R. 1.16.</p> <p><input checked="" type="checkbox"/> Any patent application processing fees under 37 CFR 1.17.</p> </div> <div style="text-align: right;"> <p>Dated: 3/21/01</p> </div> </div> <div style="margin-top: 20px;"> <p style="text-align: center;">_____ Signature</p> </div>					
<div style="border: 1px solid black; padding: 5px;"> <p>I certify that this document and fee is being deposited on 3/21/01 with the U.S. Postal Service as first class mail under 37 C.F.R. 1.8 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.</p> <p style="text-align: center;">_____ Signature of Person Mailing Correspondence</p> <p style="text-align: center;">Mark Levy</p> <p style="text-align: center;">Typed or Printed Name of Person Mailing Correspondence</p> </div>					



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Invention Disclosure EN896-0258

Method for Microetch Cleaning of Copper Circuits

Page 1

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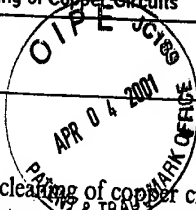
Title of Invention (Short & Descriptive) Method for Microetch Cleaning of Copper Circuits							
Disclosure No. EN896-0258		Functional Manager CRETEKOS		Receiving Date 11/18/96		Receiving Time 16:02:15	
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Area Code 02	Electronic Address MOSCHAK at ENDVM5		Manager's Name Voya Markovich		Manager's Electronic Address MARKOVIC at ENDVM5		

Table 1. Critical Dates Information	
Date invention workable:	10/01/96
Used or Planned for product:	N
If so, Product Name?	
Release?	
Announce Date?	
Public Demonstration or Use:	N
If so, When?	
Where?	
Disclosed to Non-IBMers:	N
If so, When?	
Where?	
CDA in place?	
Use in Manufacturing:	N
If so, When?	
Where?	
Product Name?	

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## Problem

Conventional microetch cleaning of copper circuits (ie. printed circuit cards and boards) in the presence of nickel / gold, or other precious metal plated contact tabs can lead to complete etch out or near etch out of circuit lines due to the galvanic etch effect associated with common etchants in the presence of precious metals.

An example of this occurs on printed circuit boards having gold plated edge connectors. These gold plated fingers are typically connected by 0.006" wide copper traces to the rest of the circuit board. Prior to shipping the finished circuit board, the board is processed thru an "Entek" process consisting of degreaser, sodium persulfate microetch and Entek to prepare the Cu lands for SMT assembly. Boards have frequently been received from vendors after this "Entek" process, in which the Cu circuit lines connecting the gold tabs have been completely, or nearly completely, etched thru due to galvanic etch effects.

Disclosed here is a sodium persulfate microetchant that is free of galvanic etch effects associated with standard microetch solutions known in the industry.

Entek is a trademark of Enthone OMI.

## Solution

A copper microetch solution of the following make-up has been defined:

- 25-150 grams/liter sodium persulfate
- 0-5% by volume phosphoric acid
- 0-0.25 Molar sodium phosphate dibasic

A preferred formulation of this microetch solution is 75-100 grams per liter of sodium persulfate, 3% by volume phosphoric acid and 0.116 Molar sodium phosphate dibasic.

This etchant is substituted for the standard sodium persulfate microetch chemistry is the standard Entek process flow. Since this formulation is free of galvanic etch effects, circuit boards can be cleaned multiple times without detrimental effects to the copper circuit lines.

Some alternative formulations to the above formulation are as follows:

- Ammonium, potassium or other persulfates could be substituted for sodium persulfate.
- Sulfuric acid, or other weak acids could be substituted for phosphoric acid. In the case of sulfuric acid, volume percent should be less than 3%, and preferably less than 1%.
- Many other phosphate salts could be substituted in place of sodium phosphate dibasic. These could include, by way of example, sodium or potassium phosphates in monobasic, dibasic or tribasic formulations.
- Typical surfactants could be added to the formulation.

## Evaluation Questions

**If this problem has been solved before, how was it solved?**

One previous solution was to insure that the soldermask or protective coating is applied over the interface of the gold plated tab to the copper circuit line. This prevents copper galvanic etching.

**Why is your solution better?**

This solution does not require a change to the circuit board design. Additionally, when the soldermask is brought closer to the gold plated connector, there is a higher probability of causing a plugging problem, due to flaking or abraded soldermask.

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